

Open Geospatial Consortium, Inc. Open GIS ® Web Map Service

1 Status of this Memo

This a description of a Proposed ESE Community Standard.

Distribution of this memo and the referenced standard is unlimited.

2 Change Explanation

Initial RFC Version. No changes.

3 Copyright Notice

Copyright © NASA (2005). All Rights Reserved.

4 Abstract

This memo nominates the Open GIS ® Web Map Service (WMS) for adoption as a NASA ESE Community Standard for web dissemination of raster and vector data as a georeferenced picture. The WMS family uses HTTP and defines several interfaces that allow the discovery of the functions a server is capable of providing, request of a specific ‘map’, and, optionally, request and delivery of information about individual features contained in the map. This nomination is for version 1.3 of the WMS specification because it is the most recent version, and as such should be used for future installations. The fact that the existing implementations use earlier versions of the specification is not relevant to the provision of data using the specification. Nor does it require the replacement of existing 1.0, 1.1 and 1.1.1 services already extant in NASA. All of the versions of the specification provide the same functionality using the same interfaces. The only impact of having a NASA system that has WMS 1.0, WMS 1.1, WMS 1.1.1 and now WMS 1.3, services in it, is on the client that will work with all of them. Commercial and open source practice for WMS clients includes the ability to negotiate versioning of the server and send the proper query to each one, which means version specificity is not a factor. It is important to note that WMS 1.3 is identical to ISO 19128 which has been approved by the relevant Technical Committee and is to be released as an International Standard this calendar year..

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6 Introduction

The OGC WMS specification is nominated to provide an industry-standard method of disseminating geospatial information that is non-proprietary, yet supported by a multitude of commercial vendors, open source and shareware applications available for use in ESE. Because of the breadth of its acceptance in the market place it will be possible for legacy systems to be easily adapted to comply and do so without extraordinary cost or time to do so.

The WMS specification is comprised of two mandatory interfaces and one optional interface. The GetCapabilities interface, which is mandatory, provides the method for a client to query and learn the capabilities of the service provided by a compliant server. It is usually the first interface exercised as the client then parses the returned document and creates a user interface display that lists the map layers, projections, image file format and symbolization options available. The GetMap interface, which is also mandatory, provides the connection for the client to send back an actual request for a georegistered picture that will be returned in the image file format selected from the list revealed in the GetCapabilities return message. The third interface, GetFeatureInfo, is optional. It allows a client to send a pixel location back to the server which then examines the image it sent, determines ‘what feature’ was used to symbolize that location and then returns the available attribute information about that feature.

7 Motivation to Adopt the OGC WMS

The motivation to adopt a standard that has been approved by both the premier legally empowered standards body in the world, the International Standards Organization, and the OGC, which is the leading provider of geospatial implementation specification standards in the world is rooted in two opportunities: reduction of cost for NASA and the user, and spreading the use of NASA data to more citizens. NASA is under continual pressure to operate more efficiently and at the same time engender greater use of its products and services. A recently published Return on Investment study funded by NASA demonstrates the cost effectiveness of not only using standards, but the very OGC WMS Specification nominated by this document. That study is found at Attachment B. The service orientation that WMS and the overall OGC Service Oriented Architecture (SOA) bring will, over time, relieve NASA of the need to have a custom viewer for each of its data sources. It will simplify the process of adapting legacy systems to an interoperable architecture and also relieve NASA of the high integration costs of having custom interfaces on each of its new systems. One viewer or a set of viewers for communities of practice will be able to display and fuse data from services that did not even exist when they were provided. Integration, by virtue of the fact that both will use the same industry-standard interface, will be easier and often done automatically by software after a new service is registered. The use of WMS will also enable citizens to access and exploit the NASA data from their existing desktop and browser software, driving cost down, and use and benefits up.

WMS is an important step into the world of SOA as currently being defined as the Federal Enterprise Architecture. Initially the family of OGC specifications, of which WMS is the oldest web iteration, will be most beneficial in extending the reach and use of NASA data to other government departments and the general citizenship. As the rest of the family, listed below, is brought into NASA use some of the barriers between internal scientific uses and external exploitation uses will be lowered too, thereby making it easier for scientists to share their data leading to more interchange.

8 OGC's work

The Open Geospatial Consortium, Inc. (OGC) is a not-for-profit, international, voluntary consensus standards organization that is leading the development of standards for geospatial and location based services. Through its member-driven consensus programs, OGC works with government, private industry, and academia to create open and extensible software application programming interfaces for geographic information systems (GIS) and other mainstream geospatial technologies such as imagery handling and processing, decision support systems, and location based services. All of its standard implementation specification are available for the public's use at no cost.

OGC Specification Family

As an international consortium OGC has produced a number of specifications that are related which allows a user to assemble them in new and innovative ways. The architecture itself and the overall scope of OGC is described in the OGC Reference Model. The OGCRM is available as Attachment C to this document.

| Title | Version | Date | Description |
|---|----------------|-------------|--|
| Open GIS ® Catalog Services | 2.0 | 2004-08-02 | Defines a common interface that enables diverse but conformant applications to perform discovery, browse and query operations against distributed and potentially heterogeneous catalog servers. |
| Open GIS ® Coordinate Transformation Services | 1.0 | 2001-01- | 12 Provides interfaces for general positioning, coordinate systems, and coordinate transformations. |
| Open GIS ® Filter Encoding | 1.1 | 2005-05-03 | This document defines an XML encoding for filter expressions based on the BNF definition of the OpenGIS Common Catalog Query Language as described in the OpenGIS Catalog Interface Implementation Specification, Version 1.0 [2]. |
| Open GIS ® Geography Markup Language | 3.1.1 | 2005-05-03 | The Geography Markup Language (GML) is an XML encoding for the transport and storage of geographic information, including both the geometry and properties |

| Title | Version | Date | Description |
|---|----------------|-------------|--|
| | | | of geographic features. |
| Open GIS ® GO-1 Application Objects (AOS) | 1.0.0 | 2005-05-04 | The GO-1 Application Objects specification defines a set of core packages that support a small set of Geometries, a basic set of renderable Graphics that correspond to those Geometries, 2D device abstractions (displays, mouse, keyboard, etc.), and supporting classes. Implementation of these APIs will support the needs of many users of geospatial and graphic information. These APIs support the rendering of geospatial datasets, provide fine-grained symbolization of geometries, and support dynamic, event and user driven animation of geo-registered graphics. |
| Open GIS ® Grid Coverages (GC) | 1.0 | 2001-01-12 | This specification was designed to promote interoperability between software implementations by data vendors and software vendors providing grid analysis and processing capabilities. |
| Open GIS ® OGC Web Services Common Specification (Common) | 1.0 | 2005-05-03 | This document specifies many of the aspects that are, or should be, common to all or multiple OWS interface Implementation Specifications. Those specifications currently include the Web Map Service (WMS), Web Feature Service (WFS), and Web Coverage Service (WCS). These common aspects include: operation request and response contents; parameters included in operation requests and responses; and encoding of operation requests and responses. |
| Open GIS ® Simple Features - SQL (SFS) | 1.1 | 1999-05-05 | The Simple Feature Specification application programming interfaces (APIs) provide for publishing, storage, access, and simple operations on Simple Features (point, line, polygon, multi-point, etc). |
| Open GIS ® Styled Layer Descriptor (SLD) | 1.0 | 2002-08-19 | The SLD is an encoding for how the Web Map Server (WMS 1.0 & 1.1) specification can be extended to allow user-defined symbolization of feature data. |
| Open GIS ® Web Coverage Service (WCS) | 1.0 | 2003-10-16 | Extends the Web Map Server (WMS) interface to allow access to geospatial "coverages" that represent values or properties of geographic locations, rather than WMS generated maps (pictures). |
| Open GIS ® Web Feature Service (WFS) | 1.1 | 2005-05-03 | The OGC Web Feature Service (WFS) interface is a collection of operations (implemented as messages carried over HTTP) for retrieving and manipulating geographic features. An implementation of the OGC WFS IS allows a client to retrieve and update geospatial data encoded in Geography Markup Language (GML) from one or more Web Feature Services. |
| Open GIS ® Web Map Context Documents (WMC) | 1.1 | 2005-05-03 | This document is a companion specification to the OGC Web Map Service Interface Implementation Specification The present Context specification states how a specific |

| Title | Version | Date | Description |
|--|----------------|-------------|--|
| | | | grouping of one or more maps from one or more map servers can be described in a portable, platform-independent format for storage in a repository or for transmission between clients. This description is known as a "Web Map Context Document," or simply a "Context." Presently, context documents are primarily designed for WMS bindings. |
| Open GIS ® Web Map Service (WMS) | 1.3 | 2004-08-02 | Provides three operations protocols (GetCapabilities, GetMap, and GetFeatureInfo) in support of the creation and display of registered and superimposed map-like views of information that come simultaneously from multiple sources that are both remote and heterogeneous. |
| Open GIS ® Reference Model (ORM) | 0.1.2 | 2003-03-04 | The ORM describes a framework for the ongoing work of the OpenGIS Consortium and our specifications and implementing interoperable solutions and applications for geospatial services, data, and applications. |
| Open GIS ® Technical Document Baseline (TDB) | 1.3 | 2004-04-22 | Spreadsheet of OGC Technical Document Baseline (in update to reflect 05 changes) |

Your attention is called to the Styled Layer Descriptor specification which offers a standard way to vary the symbology of a WMS ‘map’ and the WMS Context Document which provides a method to not only ‘save a session’, but pass that session to another user who can then recreate it on their client. The SLD is provided with this document as Attachment D, and the WMS Context is provided as Attachment E.

9 WMS 1.3

The specification is included as Attachment A.
http://portal.opengeospatial.org/files/?artifact_id=5316

10 References

Normative References: Included in Attachment A.

Informative References: Can be found at: <http://www.opengeospatial.org/specs/?page=abstract>
(Same problem as above)

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12 Appendix A

Glossary of acronyms –

| | |
|------------|---|
| 2D | Two Dimensional |
| AOS | Application Objects Specification |
| API | Application Programming Interface |
| AVIRIS | Airborne Visible/Infrared Imaging Spectrometer |
| BNF | Backus-Naur Form |
| DAAC | Digital Active Archive Center |
| ESE | Earth Science Enterprise |
| ESIP | Earth Science Information Partner |
| GC | Grid Coverage |
| GIS | Geographic Information System |
| GLOBE | Global Learning and Observations to Benefit the Environment |
| GML | Geography Markup Language |
| GMU | George Mason University |
| GO-1 | Geographic Objects - Version 1 |
| GSFC | Goddard Space Flight Center |
| HTTP | Hyper Text Transfer Protocol |
| JPL | Jet Propulsion Laboratory |
| OGC™ | Open Geospatial Consortium, Inc. |
| OGCRM | OGC Reference Model |
| ORM | OGC Reference Model |
| Open GIS ® | Registered Trademark of the OGC. |
| OWS | OpenGIS Web Services |
| PO | Physical Oceanography |

| | |
|-----|---|
| ROI | Return On Investment |
| SFS | Open GIS ® Simple Feature Specification |
| SLD | Open GIS ® Styled Layer Descriptor |
| SOA | Service Oriented Architecture |
| SQL | Structured Query Language |
| SVS | Scientific Visualization System |
| TDB | Technical Document Baseline |
| URL | Uniform Resource Locator |
| WCS | Open GIS ® Web Coverage Service |
| WFS | Open GIS ® Web Feature Service |
| WMC | Open GIS ® Web Map Context Documents |
| WMS | Open GIS ® Web Map Service See Attachment A |
| XML | eXtensible Markup Language |

13 Attachments

[RFC Editor's Note: Attachments A-E will be bundled with the final version. Until then the URLs of the documents are supplied here.]

- A. OpenGIS ® Web Map Service Specification 1.3
http://portal.opengeospatial.org/files/?artifact_id=5316
- B. NASA ROI, Dated xxx by Booz Allen Hamilton
<http://gio.gsfc.nasa.gov/docs/ROI%20Study.pdf>
- C. OGC Reference Model
http://portal.opengeospatial.org/files/?artifact_id=3836
- D. OpenGIS ® Styled Layer Descriptor Specification
https://portal.opengeospatial.org/files/?artifact_id=1188
- E. OpenGIS ® Web Map Context Specification
https://portal.opengeospatial.org/files/?artifact_id=8618
- F. NASA Implementations

Attachment F NASA Implementations of the OGC Web Map Service

There are a number of WMS instances extant in NASA, including the list below. Additionally NASA would benefit from the immediate capability to provide data to the U.S. Geological Survey “The National Map” and the Geospatial One Stop portal as well as the Department of Home Land Security Geospatial Architecture.

A sample of the existing NASA instances:

NASA Earth-Sun Gateway

<http://esg.gsfc.nasa.gov>

NASA / GMU AVIRIS Data Server:

http://viewer.digitalearth.gov/viewer.cgi?addserver=25&service=View+Layer+Menu&context=world_topo_0_1_2.xml&fullcontrol=0&config=&expand=100

Tropical Rain Forest Information Center

GetCapabilities URL prefix: <http://trfic.jpl.nasa.gov/wmt/de.pl>

GSFC Distributed Active Archive Center Map Server

GetCapabilities URL prefix: <http://eosdata.gsfc.nasa.gov/daac-bin/wmtdods>

PO-DAAC-ESIP Map Server

Version: 1.1.1 (10101)

GetCapabilities URL prefix: <http://podaac-esip.jpl.nasa.gov/cgi-bin/esip/de.pl>

JPL World Map Service

Version: 1.1.1 (10101)

GetCapabilities URL prefix: <http://wms.jpl.nasa.gov/wms.cgi>

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ESE-RFC-005v0.01
Category: Standards Track
Updates/Obsoletes :None

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The GLOBE Program Visualization Server

Version: 1.1.1 (10101)

GetCapabilities URL prefix: <http://globe.digitalearth.gov/viz-bin/wmt.cgi>

SVS Image Server <http://aes.gsfc.nasa.gov/>